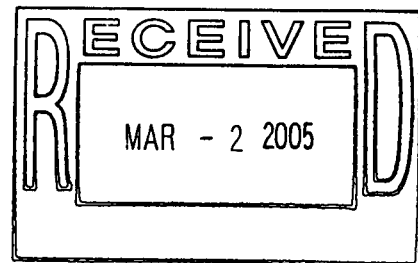


Rocky Flats Environmental Technology Site

# Building 776 Area VI Final Survey Report

**Survey Unit:  
776003**

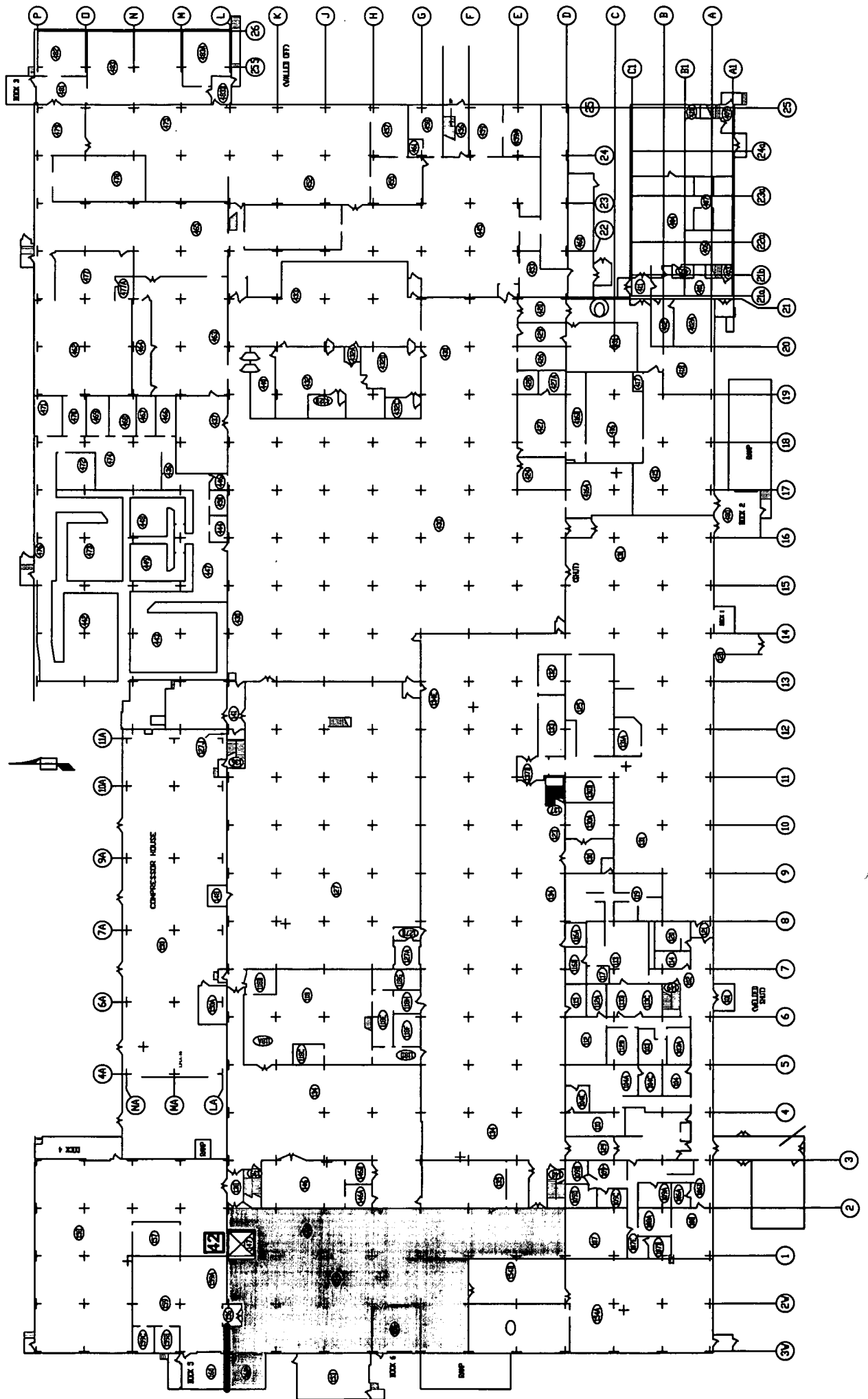
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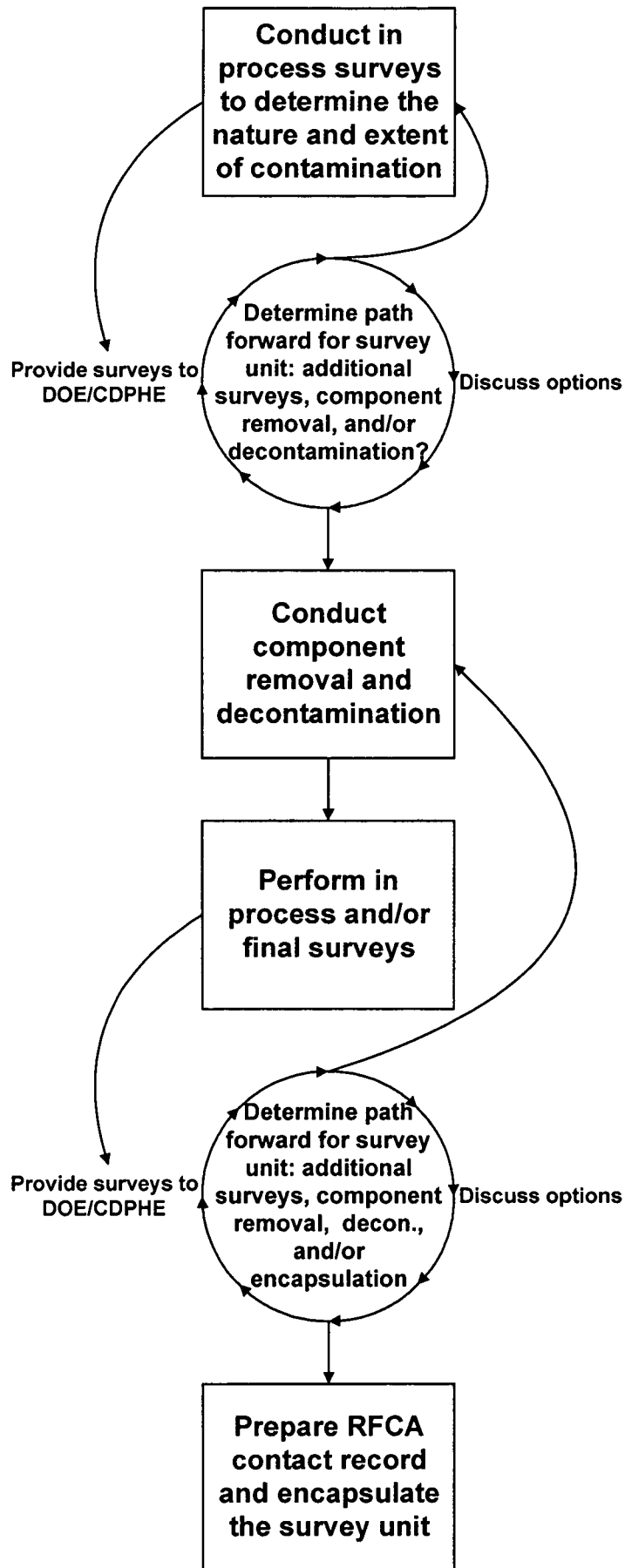


February 2005

ADMIN RECORD

## 2-





# **In-Process Survey Instructions**

## **Survey Unit 776003 Rev. 1 (11/17/04)**

### **Purpose:**

This instruction provides guidance for collecting data needed to determine the contamination levels in Survey unit 776003. Work to be performed in accordance with "INS-535-Ludlum2350-1 with Sodium Iodide Detector" and RSP-7.01 and 7.02.

### **Equipment and materials:**

- 1) A Bicron G-5 detector (G-5) attached to a Ludlum 2350-1.
- 2) A Ludlum 44-17 detector (44-17) attached to a Ludlum 2350-1.
- 3) Probe holders for the G-5 and the 44-17 with tin side shield (side shield optional for the G-5).
- 4) Electra with attached DP-6, calibrated and daily response checked.
- 5) Access to a SAC-4 that has daily performance checks completed.

### **Procedure:**

- 1) Inspect instruments for obvious damage and perform battery checks, as required.
- 2) Ensure the NaI instruments (G-5 and 44-17) are functioning by using Americium-241 source TS-912, counting the source for 60 seconds. Record readings from before and after survey (i.e., beginning and end of shift) on the daily response check sheet.
- 3) Obtain background measurements for floors, cement walls with NaI detectors in room 404. For ceilings take background measurement as specified below.
  - ✓ For floors and cement walls, place the detector (G-5 preferred or 44-17) in holder, 30 cm from floor and perform background measurement.
  - ✓ For block walls, place the detector (44-17 preferred or G-5) in holder, 30 cm from wall and perform background measurement.
  - ✓ For ceilings, background measurements will be taken in room 404. Point detector towards ceiling, place thin metal sheet over probe and take background measurement.

Perform 60-second count for all background measurements. Record all results in the designated space on the data collection sheet (this may be the remarks section).

- 4) All areas marked on the attached maps should be scanned. Use the appropriate detector and scan over each grid on the floors and ceilings. Scan over the entire surface of each grid by holding the detector within 6 inches of the surface. Scan rate should be about 1 foot per second. Listen for change in count rate. Locate the point that has the highest reading in the area and take the measurement at that point (sample location). If no elevated reading is detected during the initial scan, then use professional judgement to select sample location most likely to be contaminated in the grid and take the measurement at that point.

5) Obtain Nal measurements.

- ✓ For floors, take a 60-second Nal measurement at 30 cm placing the detector (G-5 preferred or 44-17) in the holder and centering the detector over the sample location.
- ✓ For block walls that do not go all the way to the ceiling:  
Scan along the top of the wall holding the probe three inches above the wall. Scan at 6" per second over all accessible areas. Take one contact reading in each ten foot section on the location with the highest Nal response.
- ✓ For walls, take a 30-second Nal measurement at 30 cm placing the detector (44-17 preferred) in the holder and centering the detector over the sample location. Take 30-second contact readings near wall penetrations (i.e., doorways) with elevated readings. Walls shall be surveyed by taking one measurement every 3 feet on center. No scanning is required.
- ✓ For ceilings, take a 60-second Nal measurement at 30 cm placing the 44-17 holder and centering the detector over the sample location. Ensure there is a tin back-shield on the detector.

Record all data using the grid number as the sample location number, as appropriate (i.e., specific assigned numbers for floors and ceilings. Use assigned wall and section numbers for walls.

- 6) For all Nal measurements, mark area where detector was placed for each reading by circumscribing the area where the measurement was taken.
- 7) Note any items or conditions that may have affected any measurement in the "remarks" section of the data collection sheet.

## Survey Requirements

	Surface	Type of Survey	Detector	Placement	Scan Rate / Count Time
<b>Background</b>	Block Walls	Background measurement	Ludlum 44-17	30 cm of wall in room 404.	60 seconds
	Floors and Cement Walls	Background measurement	Bicron G-5 or Ludlum 44-17, as appropriate.	30 cm of floor in room 404.	60seconds
	Metal ceilings	Background measurement	Ludlum 44-17	In room 404. Point probe upward. Place thin metal sheet over probe.	60 seconds
<b>Scan</b>	Floor	Total Alpha Activity	Preferred: Bicron G-5 Secondary: Ludlum 44-17	✓ Scan within 6" until highest reading is found	~ 1 foot per second
	Walls	Top of walls that do not go to ceiling	Ludlum 44-17	Scan within 3" until highest reading is found	~ 1/2 foot per second
	Ceiling	Total Alpha Activity	Ludlum 44-17	✓ Scan Within 6" until elevated reading is found	~ 1 foot per second
<b>Nal Measurements</b>	Floor	Total Alpha Activity	Preferred: Bicron G-5 Secondary: Ludlum 44-17	30 cm	60seconds
	Walls	Total Alpha Activity	Preferred: Ludlum 44-17 Secondary: Bicron G-5	30 cm. On contact to investigate elevated readings.	30 seconds
	Ceiling	Total Alpha Activity	Ludlum 44-17	30 cm	60 seconds
<b>TSA/RSA</b>	N/A	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A	N/A

# Area VI (Survey Unit 3) Follow-up Survey Instructions Floors

## Survey/ Sampling Instructions

### Purpose:

To collect gross gamma data to determine the effectiveness of decontamination efforts on the floors of Area VI, Survey Unit 3. Work to be performed in accordance with " INS-535-Ludlum2350-1 with Sodium Iodide Detector"

### Equipment and materials:

- 1) A Ludlum 44-17 Attached to a Ludlum 2350-1 set to collect 1-minute counts that will be displayed on its LCD window.
- 2) A Bicron G-5 Attached to a Ludlum 2350-1 set to collect 1-minute counts that will be displayed on its LCD window.
- 3) HILTI PD 28 Laser range finder or Measuring tape that is at least 10 feet long..
- 4) 2 Probe holders, One for the G-5 and one for the 44-17 with tin collimator

### Procedure:

- 1) RCT, ensure the instrument is functioning by using Americium source TS-912. Obtain one 60 second count at the beginning and end of each workday.
- 2) RCT, inspect instrument for obvious damage and perform a battery check on the instrument.
- 3) RCT, obtain a 60-second unit specific background measurement in B777, room 404.
- 4) In the highlighted grids on the attached sheet take 60-second contact readings as near as possible to the original survey location.
- 5) If survey location is above a contaminated crack or seam then relocate the sample point approximately 1-foot away. Note in the remark section any readings relocated due to original being above a contaminated crack or seam. Do not take readings directly over a hole in the floor.
- 6) Document results on Sodium Iodide Data collection Sheets. Write "2<sup>nd</sup> survey" in the remarks section at the bottom of the data sheet.

## Summary of Survey Instructions

Table -1				
Location	Type of Survey	Probe	Placement	Count time
Listed on attached spread sheet	Total Alpha	G-5 ( preferred) or 44-17	On contact with previous sample location.	60 seconds

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## Final Survey Instructions Rev. 0 (1/19/05)

Building 776 1<sup>st</sup> Floor  
Survey Unit 776003

### **Purpose:**

This instruction provides guidance for collecting gross gamma and removable contamination data to quantify the amount of residual contamination in Survey Unit 776003 prior to demolition. Nal measurements are performed in accordance with "INS-535-Ludlum2350-1 with Sodium Iodide Detector".

### **Equipment and materials:**

1. A Ludlum 44-17 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
2. A Bicron G-5 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
3. One Electra with attached DP-6, calibrated and daily response checked.
4. Two probe holders, one for the G-5 and one for the 44-17 with tin shielding.
5. Calibrated and daily response checked SAC-4.
6. Measuring tape or laser range finder.

**Note:** The NE Electra with DP-6 probe and the Eberline SAC-4 shall be used in accordance with RSP- 7.01 and 7.02

### **Procedure:**

1. Inspect instrument for obvious damage and ensure battery voltage is equal to or greater than 4.6 volts. If battery voltage is less than 4.6 volts change the batteries.
2. Complete daily performance checks for Sodium Iodide detectors to ensure the instrument is functioning properly by using Americium-241 source TS-912. Record results on Sodium Iodide Data Sheet.
3. For floor and concrete wall background measurements, perform a 300-second background count with a Bicron G-5 for floors or Ludlum 44-17 for walls at background location in room 404. Record background counts next to "Bkg Floor" or "Bkg Concrete Wall" in background column of attached "Sodium Iodide Data Collection" sheets as needed.
4. For block wall background measurements, perform a 300-second background count with a Ludlum 44-17 at background location in room 404. Record background counts next to "Bkg Block Wall" in background column of attached Sodium Iodide data collection sheets as needed.
5. For ceiling background measurements, perform a 300-second background count with a Ludlum 44-17 at background location in room 404. Hold the probe waist high, pointed toward ceiling using a sheet metal plate in front of the detector (take background measurement in this configuration). Record background counts next to "Bkg Metal Ceiling" in background column of attached Sodium Iodide data collection sheets as needed.
6. Mark the sample locations on the surfaces to be measured. Take all measurements on contact with the marked surface using tin side shields on the Bicron G-5 and tin side and back shields on the Ludlum 44-17. All Sodium Iodide readings shall have 300 second count times.
7. Collect sodium Iodide, total surface activity and removable surface activity measurements at all locations marked on the attached map.
8. Record the Nal and NE Electra measurements on the attached sheet. Note any items or conditions that may have affected the measurement in the "remarks" section.
9. Count swipes for 60 seconds with a SAC-4, record result on attached sheet for removable contamination.



Final Survey Instructions Rev. 0 (1/19/05)

Building 776 1<sup>st</sup> Floor

Survey Unit 776003

<b>Survey Requirements</b>				
<b>Surface</b>	<b>Type of Survey</b>	<b>Probe</b>	<b>Placement</b>	<b>Count Time</b>
Floor	Total Alpha Activity	Bicron G-5	On contact	300 seconds
All Surfaces	Total Alpha Activity	Electra with DP-6	On contact	60 seconds
Block walls	Total Alpha Activity	Bicron G-5 or Ludlum 44-17	On contact	300 seconds
All Surfaces	Removable Alpha	SAC-4	Swipe in placed in tray	60 seconds
Ceiling	Total Alpha Activity	Ludlum 44-17	On Contact	300 seconds
Block Walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with wall at location in room 404.	300 seconds
Floors and cement walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with floor in room 404.	300 seconds
Metal ceilings	Background measurement	Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 404.	300 seconds

# **FINAL SURVEY REPORT**

## **Survey Unit 776003**

### **Introduction and Scope**

A pre-demolition radiological survey (PDS) is performed prior to building demolition to define the radiological conditions of a facility. A PDS survey for survey unit 776003 has been completed in accordance with guidelines outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777". Based on the results it is recommended that no further remediation is needed, and that the survey unit may be encapsulated in preparation for demolition. Isolation controls shall be put in place to prevent re-contamination of the area. This report has been prepared in accordance with sections 3 and 8 of the "Radiological Pre-Demolition Survey Plan Building 776/777".

Survey unit 776003 includes rooms 144, 154, 155 and 161 and is bounded by column lines D and L to the south and north and column lines 3W and 2 to the west and east.

### **PDS Methods and Techniques**

The PDS survey results determine the Average Surface Contamination Value (ASCV<sub>u</sub>) and source term for the survey unit. These parameters are used to determine whether the building may be demolished within the limits outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777".

To comply with the "Radiological Pre-Demolition Survey Plan Building 776/777", a minimum of 30 survey points were selected per survey unit. A random start, systematic grid method was used to identify the survey point locations. Three types of surveys are performed at each survey point as follows:

- Painted surfaces are evaluated for potential contamination under coatings using sodium iodide (NaI) gamma detectors attached to a single channel analyzer windowed for the 59 keV gamma-ray (Am<sup>241</sup>).
- Direct alpha surface contamination measurements are performed using a NE Electra survey instrument with attached DP-6 probe. This data may be compared to the NaI survey data to show the fraction of contamination that is directly on the surface versus imbedded in the material matrix.
- Removable surface alpha contamination surveys were performed by swiping the survey point with a 47mm filter paper then counting the filter paper on a SAC-4 alpha counter. This data may be used to determine the effectiveness of encapsulation following the PDS.

To conservatively determine the final Average Surface Contamination Value (ASCV<sub>u</sub>) for the survey unit, the source term associated with inaccessible areas of the survey unit (as described below) is added to the source term calculated by the PDS survey.

### **ALARA Post-Remediation Surveys**

#### **Accessible Areas**

In addition to the PDS used to determine the Average Surface Contamination Value (ASCV<sub>u</sub>) and source term for the survey unit, surveys were taken to determine the effectiveness of remediation efforts. Remediation is performed to demonstrate a reasonable best effort is made to maintain releases to the environment and dose to the workers ALARA.

# FINAL SURVEY REPORT

## Survey Unit 776003

### Floors

The floors of survey unit 776003 consist of epoxy covered concrete. In-process measurements collected on the floor of 776003 show that a majority of the floor had elevated activity, including the basement in room 161, as well as the sump. The sump was remediated to < MDA. The contaminated portions of the floor surface of the rest of the survey unit were remediated by shaving before being re-surveyed. Portions of the floor that exhibited high levels of contamination in the cracks and expansion joints after shaving were removed. Remediation of the elevated floor areas resulted in a decontamination factor (DF) of 18.4 or a source term reduction of 94.6%.

**Table 1**  
**Floor Remediation Results**

	Pre-Remediation	Post-Remediation
Maximum (dpm/100cm <sup>2</sup> )	41,139,828	787,351
Average (dpm/100cm <sup>2</sup> )	880,532	47,918

### Walls

Survey measurements on the walls of survey unit 776003 were taken on an established 3-ft. by 3-ft. grid on each of the 30 wall sections within the survey unit. Wall 2A's highest contamination value is 1,453,117 dpm/100cm<sup>2</sup>, is part of the SRV wall, and will be removed prior to building demolition. Walls 9 and 10, are slightly over 100,000 dpm/100cm<sup>2</sup>, and the remaining sections of the walls in the survey unit were all <100,000 dpm/100cm<sup>2</sup>. Because the remaining source term on the walls is not significant, no further remediation is required.

**Table 2**  
**B776/777 Survey Unit 776003 - Wall Summary**

Wall	Section	Initial Characterization (Average dpm/100 cm <sup>2</sup> )			Follow-up Characterization (Average dpm/100 cm <sup>2</sup> )		
		Type I	Type II	Type III	Type I	Type II	Type III
776003-1	A	77,499			77,499		
776003-1	B	23,499			23,499		
776003-2	A			1,453,117	Remnant of SRV to be removed		
776003-2	D		121,254		89,115		
776003-2	E	98,131			88,131		
776003-2	F	89,545			89,545		
776003-3	A	73,904			73,904		
776003-4	A	25,319			25,319		
776003-4	B	25,547			25,547		
776003-5	A			1,278,286	Wall Removed		
776003-5	B		220,965		Wall Removed		
776003-6	A	20,999			20,999		
776003-6	B	20,118			20,118		
776003-6	C	22,659			22,659		
776003-6	D	3,318			3,318		
776003-7	A	99,211			99,211		
776003-8	A	99,039			99,039		
776003-9	A		100,953			100,953	

# FINAL SURVEY REPORT

## Survey Unit 776003

Wall	Section	Initial Characterization (Average dpm/100 cm <sup>2</sup> )			Follow-up Characterization (Average dpm/100 cm <sup>2</sup> )		
		Type I	Type II	Type III	Type I	Type II	Type III
776003-10	A		109,938			109,938	
776003-11	A	2,808			2,808		
776003-12	A	21,492			21,492		
776003-13	A	5,493			5,493		
776003-14	A	2,589			2,589		
776003-15	A	61,604			61,604		
776003-16	A			1,218,025	Wall Removed		
776003-17	A	26,088			26,088		
776003-18	A	9,487			9,487		
776003-19	A	12,876			12,876		
776003-20	A	6,026			6,026		
776003-21	A	38,540			38,540		
776003-22	A	94,399			94,399		
776003-23	A	45,478			45,478		
776003-24	A	23,764			23,764		
	Type I:						
	Type II:						
	Type III:						

### Ceilings

Survey measurements revealed that all accessible ceiling surfaces after follow-up surveys were performed in the survey unit are <100,000 dpm/100cm<sup>2</sup>.

### Inaccessible Areas

#### Floors

It is conservatively assumed that the contamination is uniformly distributed on both sides of each crack or seam and the contamination on the bottom of the crack or seam is the same magnitude as the contamination measured at the surface.

Contaminated seams were identified on the floor of survey unit 776003 located in survey grids. The seams were separated into two groups of seams. Group 1 seams could be effectively decontaminated. The highest contamination value for this group of seams was 11,428,583 dpm/100 cm<sup>2</sup> prior to decontamination. Most of the contaminated material was removed and readings in these seams were significantly reduced to levels between 14,171 and 787,351 dpm/100 cm<sup>2</sup> averaging 400,761 dpm/100 cm<sup>2</sup>. The total length of these seams is approximately 220 feet (67.1 m) long by 6 inches (0.15 m) wide. The amount of activity remaining in this group of seams is estimated at:

#### Group 1 Seams

$$(2 * 67.1 \text{ m} * 0.15 \text{ m}) * (400,761 \text{ dpm/100 cm}^2 * 10,000 \text{ cm}^2/\text{m}^2) * (1\mu\text{Ci}/2.22\text{E}6 \text{ dpm}) = 363.4 \mu\text{Ci}$$

The amount of source term removed from this group of seams is conservatively estimated at:

$$(2 * 67.1 \text{ m} * 0.15 \text{ m}) * (11,428,583 - 400,761 \text{ dpm/100 cm}^2) * 10,000 \text{ cm}^2/\text{m}^2 * (1\mu\text{Ci}/2.22\text{E}6 \text{ dpm}) = 9,999.5 \mu\text{Ci}$$

# FINAL SURVEY REPORT

## Survey Unit 776003

Group 2 seams were remediated down to soil. The highest contamination value for this group of seams was 41,139,828 dpm/100 cm<sup>2</sup> prior to decontamination. Because of the extent of flooring removed, post decontamination readings were not obtained.

In addition to the seams, a 300 ft<sup>2</sup> (27.9 m<sup>2</sup>) section of the floor in room 154 was chipped out, but was not remediated to soil. The contamination remaining on the concrete surface is estimated as follows:

$$(27.9 \text{ m}^2) * (400,761 \text{ dpm}/100 \text{ cm}^2 * 10,000 \text{ cm}^2/\text{m}^2) * (1 \mu\text{Ci}/2.22\text{E}6 \text{ dpm}) = 503.6 \mu\text{Ci}$$

The total source term for the inaccessible surfaces of the floors is **867.0**  $\mu\text{Ci}$ .

### Ceiling/Walls

The inaccessible areas of the ceiling and walls have the same or less potential for contamination as the accessible areas of the walls and ceilings of survey unit 776003 and therefore were not evaluated.

### PDS Data Summary

The values for the accessible areas and inaccessible areas were summed and divided by the total area for the survey unit to calculate the "Average Surface Contamination Value" (ASCV<sub>u</sub>) and source term for the survey unit. The results are summarized in Table 3 below:

**Table 3:**  
**PDS Final Results**

	Final Results
776003 Inaccessible Area Source Term ( $\mu\text{Ci}$ )	867.00
776003 Accessible Area Source Term ( $\mu\text{Ci}$ )	2,099.71
776003 Total Source Term ( $\mu\text{Ci}$ )	2966.71
Survey Unit Wall, Ceiling, and Floor Area (m <sup>2</sup> )	1,938
(ASCV <sub>u</sub> ) ( $\mu\text{Ci}/\text{m}^2$ )	1.53
(ASCV <sub>u</sub> ) (dpm/100cm <sup>2</sup> )	33,984

## 776003 In-Process and Follow-up Floor Survey Results

	Location #	Column letter	Column Number	North	East	Elevation	dpm/100cm <sup>2</sup>	Follow-up (dpm/100 cm <sup>2</sup> )
1/22/05	3-2	K	3W	16	18	Floor	24,215	24,215
1/22/05	3-3	K	3W	12	4	Floor	13,617	13,617
1/22/05	3-4	K	3W	16	15	Floor	60,058	60,058
1/22/05	3-5	K	2W	11	7	Floor	13,617	13,617
1/22/05	3-6	K	2W	11	15	Floor	13,617	13,617
1/22/05	3-7	K	1	15	19	Floor	2,440,933	438,989
1/22/05	3-8	K	1	1	14	Floor	48,310	48,310
1/22/05	3-9	K	1	5	5	Floor	14,865	14,865
1/22/05	3-9A	K	1	7	9	Floor	55,863	55,863
1/22/05	3-10	K	2W	5	19	Floor	13,617	13,617
1/22/05	3-11	K	2W	4	6	Floor	13,617	13,617
1/22/05	3-12	K	3W	1	19	Floor	13,617	13,617
1/22/05	3-13	K	3W	3	9	Floor	13,617	13,617
1/22/05	3-15	J	3W	14	4	Floor	13,617	13,617
1/22/05	3-16	J	3W	15	15	Floor	13,617	13,617
1/22/05	3-17	J	2W	19	5	Floor	13,617	13,617
1/22/05	3-18	J	2W	19	19	Floor	13,617	13,617
1/22/05	3-19	J	1	12	5	Floor	24,695	24,695
1/22/05	3-20	J	1	11	18	Floor	26,253	26,253
1/22/05	3-21	J	1	7	18	Floor	2,058,835	Soil Note
1/22/05	3-22	J	1	6	7	Floor	13,617	13,617
1/22/05	3-23	J	2W	2	12	Floor	13,617	13,617
1/22/05	3-24	J	2W	5	8	Floor	23,736	23,736
1/22/05	3-25	J	3W	6	15	Floor	13,617	13,617
1/22/05	3-26	J	3W	2	6	Floor	13,617	13,617
1/22/05	3-27	K	2W	9	8	Floor	13,617	13,617
1/22/05	3-28	K	2W	19	19	Floor	61,737	61,737
1/22/05	3-29	H	2W	14	8	Floor	11,428,533	787,351
1/22/05	3-30	H	2W	11	16	Floor	14,863	84,273
1/22/05	3-31	H	1	15	1	Floor	41,439,323	Soil Note
1/22/05	3-32	H	1	18	18	Floor	125,391	125,391
1/22/05	3-33	H	1	7	18	Floor	36,203	36,203
1/22/05	3-34	H	1	8	8	Floor	476,511	Soil Note
1/22/05	3-35	H	2W	1	16	Floor	223,660	94,223
1/22/05	3-36	H	2W	1	2	Floor	13,617	13,617
1/22/05	3-37	K	2W	5	20	Floor	17,862	17,862
1/22/05	3-38	K	2W	5	8	Floor	13,617	13,617
1/22/05	3-39	G	3W	16	4	Floor	13,617	13,617
1/22/05	3-40	G	3W	17	19	Floor	13,617	13,617
1/22/05	3-41	G	2W	19	9	Floor	577,447	161,354
1/22/05	3-42	G	2W	19	19	Floor	30,688	30,688

Note: "Soil" indicates location where the concrete slab was remediated to soil.

## 776003 In-Process and Follow-up Floor Survey Results

	Location #	Column letter	Column Number	North	East	Elevation	dpm/100cm <sup>2</sup>	Follow-up (dpm/100 cm <sup>2</sup> )
1/22/05	3-43	G	1	19	1	Floor	59,819	59,819
1/22/05	3-44	G	1	18	18	Floor	<del>369,224</del>	34,884
1/22/05	3-45	G	1	1	12	Floor	13,617	13,617
1/22/05	3-46	G	1	9	1	Floor	<del>183,412</del>	195,399
1/22/05	3-47	G	2W	1	11	Floor	14,145	14,145
1/22/05	3-48	G	2W	4	1	Floor	60,058	60,058
1/22/05	3-49	G	3W	5	19	Floor	13,617	13,617
1/22/05	3-50	G	3W	5	5	Floor	13,617	13,617
1/22/05	3-51	F	3W	14	7	Floor	13,617	13,617
1/22/05	3-52	F	3W	14	12	Floor	13,617	13,617
1/22/05	3-53	F	2W	19	8	Floor	13,617	13,617
1/22/05	3-54	F	2W	19	12	Floor	13,617	13,617
1/22/05	3-55	F	1	11	3	Floor	46,752	46,752
1/22/05	3-56	F	1	20	17	Floor	13,617	13,617
1/22/05	3-57	F	1	11	3	Floor	46,752	46,752
1/22/05	3-58	F	1	5	1	Floor	13,617	13,617
1/22/05	3-59	F	2W	8	15	Floor	<del>1,557,560</del>	<del>56,192</del>
1/22/05	3-59B	F	2W	6	19	Floor	13,617	13,617
1/22/05	3-60	F	2W	5	3	Floor	32,846	32,846
1/22/05	3-61	F	3W	3	19	Floor	13,617	13,617
1/22/05	3-62	F	3W	1	1	Floor	13,617	13,617
1/22/05	3-63	E	1	15	2	Floor	13,617	13,617
1/22/05	3-64	E	1	19	14	Floor	13,617	13,617
1/22/05	3-65	E	1	1	14	Floor	13,617	13,617
1/22/05	3-66	E	1	3	1	Floor	46,992	46,992
1/22/05	3-66A	E	1	6	8	Floor	13,617	13,617
1/22/05	3-67	D	1	16	6	Floor	13,617	13,617
1/22/05	3-68	D	1	17	19	Floor	<del>547,478</del>	14,171
1/22/05	3-69	D	1	2	11	Floor	13,617	13,617
1/22/05	3-70	D	1	6	8	Floor	25,174	25,174
						Average	<b>880,532</b>	47,918

Note: "Soil" indicates location where the concrete slab was remediated to soil.

## Attachment 1

### Standard Method for Calculating the ASCV for Each Survey Unit

#### Prerequisites:

1. Final survey map for the survey unit
2. PDS survey results
3. Survey information used to estimate activities in inaccessible areas;
4. Survey information for any structural members or elevated regions not represented by the PDS survey.

#### Conversions:

1 square meter ( $m^2$ ) =  $100 \times 100 \text{ cm}^2$

1 microcurie ( $\mu\text{Ci}$ ) =  $2.22 \times 10^6 \text{ dpm}$

1 ( $\mu\text{Ci}/m^2$ ) =  $22,200 \text{ dpm}/100\text{cm}^2$  evenly distributed over one square meter.

12 inches = 1 foot = 0.305 meters

#### Calculations:

##### Accessible Area Inventory

1. Calculate the average surface contamination for the applicable survey unit from a minimum of 30 sodium iodide measurements obtained by the PDS survey.
2. Average the total surface contamination activity present.
3. Convert the average surface contamination value from step 2 from " $\text{dpm}/100\text{cm}^2$ " to " $\mu\text{Ci}/m^2$ "

##### Example:

$$22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/m^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1 \mu\text{Ci}/m^2$$

4. Obtain surface area of survey unit from title box of final survey map. This is reported in square meters.
5. Calculate inventory for accessible areas

The surface area from a survey unit map title box is 1,000 square meters and the average contamination level from the 30 PDS points is  $22,200 \text{ dpm}/100\text{cm}^2$ .

##### Example:

$$1,000 \text{ m}^2 \times 22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/m^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1,000 \mu\text{Ci}$$

##### Inaccessible Area Inventory

1. Document methods used to estimate contamination levels and potential inventory in seams, cracks or other surfaces in the final survey report. Provide an estimated remaining inventory for each item/area in the report.

##### Example:

There are 20 feet of seams contaminated to an average level of  $2,220,000 \text{ dpm}/100 \text{ cm}^2$ . Each seam has two sides. The total inventory can be estimated assuming the contamination levels measured at the top of the seam extend down each side of the seam. The depth of the seam can be determined from design drawings or from direct observation as the seam is chipped away. If a seam is determined to be 4 inches deep, then the inventory of the seam can be calculated as follows:

The contaminated area of the seam is:

$$(20 \text{ feet} \times .305 \text{ m/ft}) \times (.3 \text{ feet} \times 0.305 \text{ m/ft}) = .61 \text{ m}^2 \times 2 \text{ sides} = 1.22 \text{ m}^2$$

Therefore the inventory in the seam in  $\mu\text{Ci}$  is:

$$1.22 \text{ m}^2 \times (2,220,000 \text{ dpm}/100 \text{ cm}^2) \times (10,000 \text{ cm}^2/m^2) \times \mu\text{Ci}/2.22\text{E}6 \text{ dpm} = 122 \mu\text{Ci}$$



## Attachment 1

### Calculating the ASCV

1. Sum the inventories from the inaccessible areas with the inventory for the accessible area to obtain a total inventory for the survey unit.

Total Inventory = Accessible Inventory + Inaccessible inventory + Inventory items (areas not represented by other inventories listed i.e. Stairs, columns, etc)

**Example:** 1000  $\mu\text{Ci}$  = accessible inventory

122  $\mu\text{Ci}$  = inaccessible inventory

100  $\mu\text{Ci}$  = inaccessible contamination in the columns and contamination on the stairs

$$1000 + 122 + 100 = 1222 \mu\text{Ci}$$

2. Divide the total inventory for the survey unit by the accessible area of the survey unit obtained from the final survey map.

**Example:** 1222  $\mu\text{Ci}$  = total inventory

1000  $\text{m}^2$  = total surface area of the survey unit

$$1222 \mu\text{Ci} / 1,000 \text{ m}^2 = 1.22 \mu\text{Ci} / \text{m}^2$$

$$1.22 \mu\text{Ci} / \text{m}^2 * (1 \text{ m}^2 / (100 * 100 \text{ cm}^2)) * (2.22 \text{E}6 \text{ dpm} / \mu\text{Ci}) = 27084 \text{ dpm} / 100 \text{ cm}^2$$

# Survey Unit 776003 PDS Summary

## Total Surface Activity Measurements

30	30	
Number Required	Number Obtained	
MIN	5,709	dpm/100 cm <sup>2</sup>
MAX	91,659	dpm/100 cm <sup>2</sup>
Average	24,052	dpm/100 cm <sup>2</sup>
STD DEV	19,327	dpm/100 cm <sup>2</sup>

Total Surface Area	1938	m <sup>2</sup>
Inaccessible Areas	867.00	μCi, Alpha
Accessible Surfaces	2,099.71	μCi, Alpha

Total Inventory	2,966.71	μCi, Alpha
ASCV <sub>u</sub>	33,984	dpm/100cm <sup>2</sup>
ASCV <sub>u</sub>	1.53	μCi per m <sup>2</sup>

# Total Surface Activity

Survey Area:		VI	Survey Unit:		776003		
Meter Model:		NE Electra w/ DP6 Probe				Dates Counted:	11/19,20/04
Instrument #:		3980	837	1503	NA	NA	A priori MDA: 94
Cal. Due Date:		3/21/05	6/29/05	6/8/05	NA	NA	Avg. Local Bkgd 3.5
Efficiency (c/d):		0.220	0.330	0.218	NA	NA	Avg. Efficiency 0.256
Sample Location #	RCT ID #	Inst. #	Instrument (cpm)		Local Bkgd (cpm)		(dpm/100 cm <sup>2</sup> )
1	513731	3980	8		1.0		27.3
2	513731	837	0		0.1		-0.4
3	513731	3980	7		0.0		27.3
4	513731	3980	13		3.0		37.1
5	513731	3980	16		3.0		50.8
6	513731	3980	13		4.0		33.6
7	513731	3980	9		1.0		31.3
8	516375	1503	153		6.0		574.2
9	516375	1503	39		5.0		133.2
10	513731	837	29		0.1		112.9
11	513731	837	4		0.1		15.2
12	513731	837	2		0.1		7.4
13	513731	837	3		0.1		11.3
14	516375	1503	40		8.0		124.6
15	516375	1503	29		11.0		71.5
16	516375	1503	98		6.0		359.0
17	513731	837	2		0.1		7.4
18	513731	837	3		0.1		11.3
19	516375	1503	78		8.0		273.4
20	516375	1503	148		8.0		546.5
21	516375	1503	867		12.0		3338.7
22	516375	1503	354		11.0		1339.8
23	516375	1503	94		8.0		334.8
24	513731	837	2		0.1		7.4
25	516375	1503	600		8.0		2312.5
26	513731	3980	10		1.0		34.0
27	513731	837	3		0.1		11.3
28	513731	837	7		0.1		27.0
29	513731	837	2		0.1		7.4
30	513731	837	0		0.1		-0.4
					MIN	-0.4	
					MAX	3338.7	
					MEAN	328.9	
					SD	743.9	

## Removable Activity

Survey Area:		VI	Survey Unit:		776003
Dates Counted:	1/19/05	1/20/05	1/21/05		
A priori MDA:	16				
Efficiency (c/d)	0.333				
Smear Location Number	Smear Results				
	RCT ID #	Serial Number	Gross (cpm)	Bkg.	(dpm/100 cm <sup>2</sup> )
1	513731	1352	2	0.3	5
2	513731	4679	8	3.8	13
3	513731	1352	1	0.3	2
4	513731	1352	2	0.3	5
5	513731	1352	2	0.3	5
6	513731	1352	1	0.3	2
7	513731	1352	3	0.3	8
8	516375	837	3	0.2	8
9	516375	837	1	0.2	2
10	513731	4679	23	3.0	59
11	513731	4679	8	2.0	17
12	513731	4679	15	2.0	39
13	513731	4679	53	6.0	140
14	516375	837	7	0.2	20
15	516375	837	1	0.2	2
16	516375	837	0	0.2	-1
17	513731	4679	8	2.0	18
18	513731	4679	23	3.0	60
19	516375	837	3	0.2	8
20	516375	837	4	0.2	11
21	516375	837	11	0.2	32
22	516375	837	9	0.2	26
23	516375	837	4	0.2	11
24	513731	4679	19	6.0	38
25	516375	837	47	0.2	141
26	513731	1352	3	0.3	8
27	513731	4679	308	1.0	922
28	513731	4679	52	5.0	141
29	513731	4679	8	1.0	20
30	513731	4679	15	0.1	45
				MIN	-0.6
				MAX	921.9
				MEAN	60.3
				SD	167.8

## Data and Sodium Iodide Instrument Information

Survey Area:	VI	Survey Unit:	776003	Survey Date(s):	01/19/05
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### Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:	192616	192616
Detector Model:	Ludlum 44-17	Ludlum 44-17
Detector #:	199765	199765
Detector Size (cm <sup>2</sup> ):	17.8	17.8
Calibration Due Date:	3/30/05	3/30/05
Count Time (min)	5	5
Contact Efficiency	8.00%	8.00%

### Ratio Used

Pu to Am - 241	8.1
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### Comments

In cases where the critical level is greater than the calculated dpm/100cm<sup>2</sup>, the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

### Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	603	512
Gamma (Floors)	N/A	N/A
Gamma (Block Walls)	N/A	494
Gamma (Solid Walls)	609	503

### Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	120.6	102.4
Gamma (Floors)	N/A	N/A
Gamma (Block Walls)	121.8	98.8
Gamma (Metal Walls)	121.8	100.6

### Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.080	0.080
Epoxy	0.065	0.065
Other	0.076	0.076

### Coatings

Coatings	Thickness (Inches)
Thin/No Paint	0.007
Epoxy	0.250
Other	0.06

## Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	VI	Survey Unit:	776003	Survey Date(s):	01/19/05
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/cm2)	Total Alpha (dpm/cm2)
1	513731	1	587	6,538	6,538
2	513731	2	546	5,918	5,951
3	513731	1	511	6,538	6,538
4	513731	1	444	6,538	6,538
5	513731	1	541	6,538	6,538
6	513731	1	646	6,538	6,538
7	513731	1	452	6,538	6,538
8	N/A	N/A	N/A	N/A	N/A
9	N/A	N/A	N/A	N/A	N/A
10	513731	2	558	5,918	7,325
11	513731	2	923	5,918	49,099
12	513731	2	389	5,918	5,918
13	513731	2	1,143	5,918	74,277
14	N/A	N/A	N/A	N/A	N/A
15	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A
17	513731	2	462	5,918	5,918
18	513731	2	1,362	5,918	99,342
19	N/A	N/A	N/A	N/A	N/A
20	N/A	N/A	N/A	N/A	N/A
21	N/A	N/A	N/A	N/A	N/A
22	N/A	N/A	N/A	N/A	N/A
23	N/A	N/A	N/A	N/A	N/A
24	513731	2	1,718	5,918	140,086
25	N/A	N/A	N/A	N/A	N/A
26	513731	1	1,113	6,538	58,369
27	513731	2	1,011	5,918	59,170
28	513731	2	2,668	5,918	248,812
29	513731	2	587	5,918	10,644
30	513731	2	689	5,918	22,318

## Sodium Iodide Instrument Information

Survey Area:	VI	Survey Unit:	776003	Survey Date(s):	01/21/05
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### Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:		192616
Detector Model:	Ludlum 44-17	Bicron G-5
Detector #:		B192N
Detector Size (cm <sup>2</sup> ):	17.8	125
Calibration Due Date:		6/14/05
Count Time (min)	5	5
Contact Efficiency		7.80%

### Ratio Used

Pu to Am - 241	8.1
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### Comments

In cases where the critical level is greater than the calculated dpm/100cm<sup>2</sup>, the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

### Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	N/A	N/A
Gamma (Floors)	N/A	7978
Gamma (Walls)	N/A	N/A

### Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	N/A	N/A
Gamma (Floors)	N/A	1595.6
Gamma (Walls)	N/A	N/A

### Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.000	0.077
Epoxy	0.000	0.063
Other	0.000	0.051

### Coatings

	Thickness (inches)
Thin/No Paint	0.015
Epoxy	0.250
Other	0.5

## Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	VI	Survey Unit:	776003	Survey Date(s):	01/21/05
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/100cm2)	Total Alpha (dpm/100cm2)
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	N/A	N/A	N/A
8	516375	2	15006	3,497	118,285
9	516375	2	12132	3,497	69,914
10	N/A	N/A	N/A	N/A	N/A
11	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
13	N/A	N/A	N/A	N/A	N/A
14	516375	2	13008	3,497	84,658
15	516375	2	12065	3,497	68,786
16	516375	2	13095	3,497	86,122
17	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A
19	516375	2	12047	3,497	68,483
20	516375	2	15374	3,497	124,479
21	516375	2	22213	3,497	239,583
22	516375	2	19678	3,497	196,917
23	516375	2	15552	3,497	127,474
24	N/A	N/A	N/A	N/A	N/A
25	516375	2	16112	3,497	136,900
26	N/A	N/A	N/A	N/A	N/A
27	N/A	N/A	N/A	N/A	N/A
28	N/A	N/A	N/A	N/A	N/A
29	N/A	N/A	N/A	N/A	N/A
30	N/A	N/A	N/A	N/A	N/A



# Survey Unit 776003

Sample Location Number	Nal Activity Measurements				
	Measurement Used	Comment	Surface	Coating	(dpm/100 cm <sup>2</sup> )
1	Sodium Iodide	N/A	wall	thin/no paint	31,349
2	Sodium Iodide	N/A	wall	thin/no paint	21,596
3	Sodium Iodide	N/A	wall	thin/no paint	38,117
4	Sodium Iodide	N/A	wall	thin/no paint	49,960
5	Sodium Iodide	N/A	wall	thin/no paint	62,101
6	Sodium Iodide	N/A	wall	thin/no paint	7,211
7	Sodium Iodide	N/A	wall	thin/no paint	7,211
8	Sodium Iodide	N/A	wall	thin/no paint	7,211
9	Sodium Iodide	N/A	wall	thin/no paint	7,211
10	Sodium Iodide	N/A	wall	thin/no paint	9,454
11	Sodium Iodide	N/A	wall	thin/no paint	7,211
12	Sodium Iodide	N/A	wall	thin/no paint	25,278
13	Sodium Iodide	N/A	wall	thin/no paint	32,842
14	Sodium Iodide	N/A	wall	thin/no paint	34,036
15	Sodium Iodide	N/A	wall	thin/no paint	41,003
16	Sodium Iodide	N/A	wall	thin/no paint	23,089
17	Sodium Iodide	N/A	wall	thin/no paint	14,530
18	Sodium Iodide	N/A	ceiling	thin/no paint	15,625
19	Sodium Iodide	N/A	ceiling	thin/no paint	13,435
20	Sodium Iodide	N/A	ceiling	thin/no paint	24,980
21	Sodium Iodide	N/A	ceiling	thin/no paint	11,345
22	Sodium Iodide	N/A	wall	thin/no paint	32,444
23	Sodium Iodide	N/A	ceiling	thin/no paint	15,028
24	Sodium Iodide	N/A	ceiling	thin/no paint	20,999
25	Sodium Iodide	N/A	ceiling	thin/no paint	19,407
26	Sodium Iodide	N/A	ceiling	thin/no paint	38,614
27	Sodium Iodide	N/A	ceiling	thin/no paint	91,659
28	Sodium Iodide	N/A	ceiling	thin/no paint	5,709
29	Sodium Iodide	N/A	ceiling	thin/no paint	5,709
30	Sodium Iodide	N/A	wall	thin/no paint	7,211
				MIN	5,709
				MAX	91,659
				AVERAGE	24,052
				SD	19,327

# **RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER**

Survey Area: VI

Survey Unit: 776003

Classification: 2

Building: 776

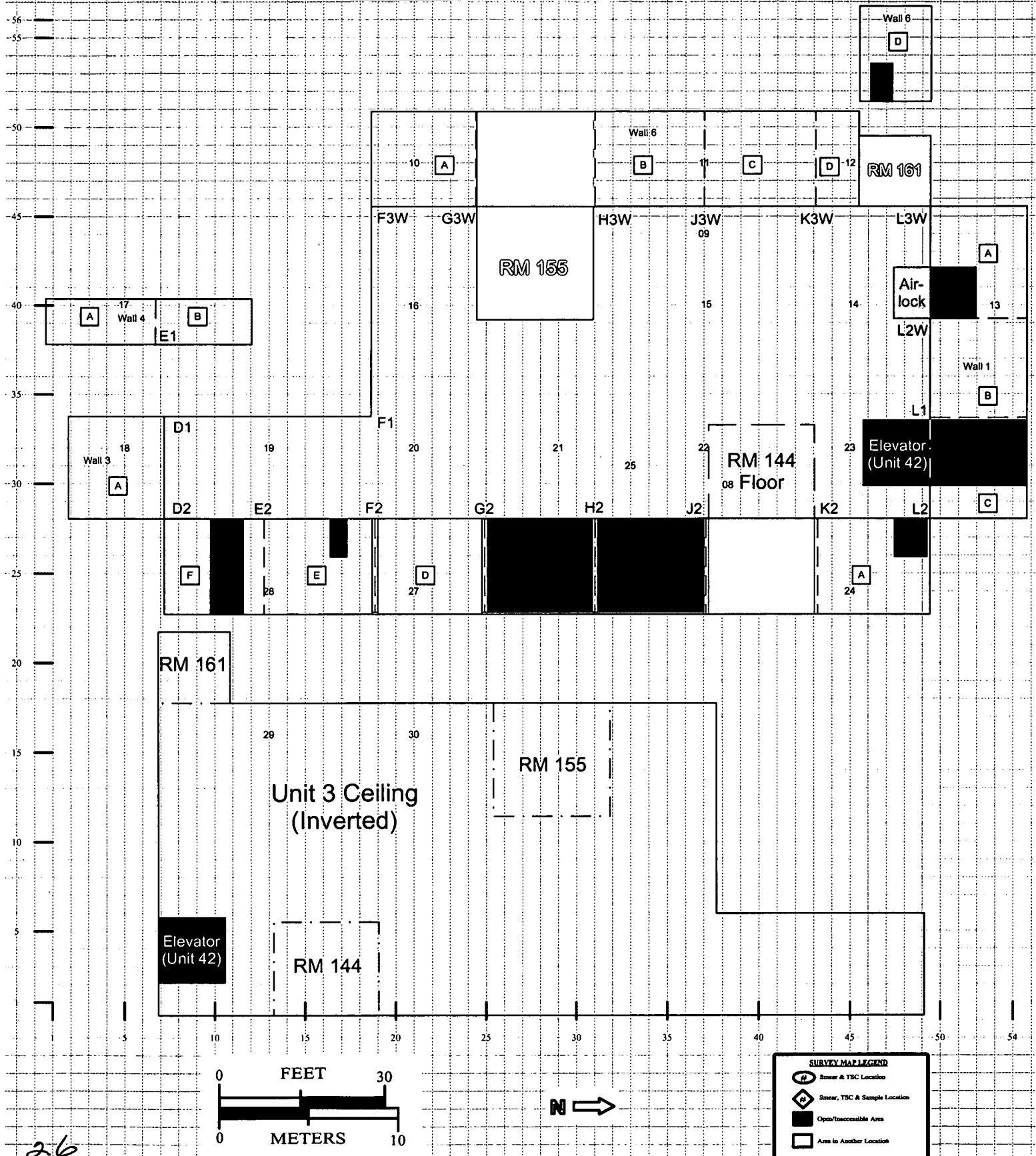
Survey Unit Description: First floor

Total Floor Area: 613 sq. m

Total Area: 1938 sq. m

Random Start Grid Size: 8 x 8 sq. m

## **SURVEY UNIT 776003 - MAP 1 OF 2**



# RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: VI

Survey Unit: 776003

Classification: 2

Building: 776

Survey Unit Description: First floor

Total Floor Area: 613 sq. m

Total Area: 1938 sq. m

Random Start Grid Size: 8 x 8 sq. m

## SURVEY UNIT 776003 - MAP 2 OF 2

